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Washington, D.C. 20505

DIRECTORATE OF INTELLIGENCE

26 OCT 1984

MEMORANDUM FOR: Robert Pelletreau
Deputy Assistant Secretary for
Near Eastern and South Asian Affairs
Department of State

FROM: [redacted] 25X1
Director of Global Issues

SUBJECT: Syrian Use of Yarmuk River Water [redacted] 25X1

1. The attached memorandum presents an updated version of our estimate of Syrian water diversion from Yarmuk River [redacted] 25X1

[redacted] The most important changes resulted from taking 25X1
into account non-irrigation water consumption and subtracting some return flow to the Yarmuk of water used by Syria. Although the net effect was to reduce our estimate, the total Syrian diversion is still significant to Jordan and Israel and will continue to increase. [redacted] 25X1

2. A map detailing the locations of Syrian reservoirs and springs will be published shortly and will be forwarded as soon as it is available. Other portions of our work on Yarmuk River use--by Jordan and Israel--are in process and will be presented to you as they are completed. [redacted] 25X1

3. This memorandum was prepared by [redacted] 25X1 Near East Branch, Geography Division, Office of Global Issues. [redacted] 25X1

4. Comments and suggestions on this memorandum are welcome and may be addressed to the Chief, Geography Division, OGI, on [redacted] 25X1

[redacted] 25X1

Attachment:
Syria: Use of Yarmuk River Water Sources [redacted] 25X1
GI M 84 10181 October 1984, [redacted] 25X1

[redacted] 25X1

[redacted] 25X1

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SUBJECT: Syria: Use of Yarmuk River Water Sources [redacted] 25X1

OGI/GD/NE/[redacted] (Oct 1984) 25X1

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Syria: Use of Yarmuk River Water Sources

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Summary

We estimate that Syria's use of Yarmuk River water is approximately 210 million cubic meters (mcm) annually and that consumption is increasing steadily. This total includes approximately 185 mcm for irrigation, and 25 mcm for domestic, industrial, and animal consumption. We believe that about one-third of this water returns to the watershed's aquifers and streams as runoff. The net diversion of Yarmuk water by Syria is therefore on the order of 140 mcm (4.4 m^3 per second on an annual basis), or nearly one-third of the river's historic annual flow. This reduction of the Yarmuk's flow takes place in all months, but is probably greater during the peak irrigation season in summer. In future years, as Syria's new water requirements are increasingly met from stored reservoir water, a larger share of the total diversion requirements will come from winter runoff.

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Our estimate of annual Syrian water usage is based primarily on analysis of the amount of land that is irrigated by Syria in the Yarmuk Basin, because Syria--like Israel and Jordan--does not publish official statistics on actual water usage from the Yarmuk.

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This memorandum was prepared by Geography Division, Office of Global Issues. The information is updated to 11 October 1984. Comments may be directed to Chief, Geography Division

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Syria: Use of Yarmuk River Water Sources

Irrigated Area in Syria's Yarmuk Basin

Irrigated agriculture has been an important activity in this part of southwestern Syria since at least the 1950's. According to calculations prepared for the Johnston mission in 1954, Syria planned to irrigate 68,000 dunams on the Yarmuk Plateau by tapping water from seven springs that feed Yarmuk tributaries. The annual water requirement for this area was estimated at 1000 m^3 per dunam, or 68 mcm annually. Because some of this water would return to the streams, the annual depletion was estimated at no more than 48 mcm upon full development of the irrigable area. To supply other Syrian irrigated areas in the Yarmuk gorge and on what is now the Israeli-occupied Golan Heights, the Johnston Plan allocated Syria an additional 22 mcm, for a total of 90 mcms from the Yarmuk River.[1]

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Since the 1950s Syrian agricultural development has far outstripped these plans. By the mid 1970s Syria had placed more than 100,000 dunams under irrigation in Dar'a and Al Qunaytirah Governorates. Most of the water was obtained from springs that feed Yarmuk tributaries, although in the 1970s some reservoirs were built to catch surface runoff. The amount of area irrigated in any given year depended on the amount of water available during the irrigation season from the previous winter's rainfall. Double-cropping (mainly tomatoes and other vegetables in summer, and winter wheat and vegetables in the winter/spring season) was widely practiced. Even with double-cropping, however, because of water shortages the total area in crops was less than the area available for irrigation. For example, during the summer season only about 60 percent of the area reported as irrigated land actually produced crops (table 1).

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[1]The following discussion focuses on the portion of the Yarmuk Basin that is now under Syrian control. It notes, however, that Israeli reservoirs in the Golan Heights portion of the Yarmuk Basin have a current capacity of about 10 mcm. Total Israeli water use on the Golan Heights is on the order of 35 mcm annually.

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TABLE 1

Irrigation Agriculture

in Dar'a and Al Qunaytirah Governorates (dunams)

	1975	1976	1977
Winter Crops (total)	**30,170**	**39,270**	**37,190**
Wheat & Barley	13,300	23,820	24,500
Vegetables	16,870	15,390	12,690
Summer Crops (total)	**41,170**	**88,370**	**67,380**
Maize	5,400	5,120	13,770
Tomatoes	17,530	21,350	24,040
Other Vegetables	18,240	61,900	29,570
Perennial Fruit Crops	**9,340**	**10,470**	**11,800**
Total Crop Area	**80,680**	**138,050**	**116,370**
Irrigated Land	**91,990**	**155,010**	**124,370**

Since 1977 official information has not been available on the amount of land that actually produced crops or since 1982 on the amount of land classified as irrigated (table 2). Nevertheless, information on new reservoir construction and well drilling indicates that there has been a significant increase in irrigation water availability and use. For example, references in the Syrian media to the amount of irrigated land associated with individual reservoir construction projects cite a total of 163,000 dunams that will be irrigated when the projects are completed (table 3). Presumably the greater availability of water from these reservoirs will allow an increasing share of this irrigated area to be cropped in both winter and summer. Based on the available data, we believe that the total irrigated area (assuming normal rainfall) now averages at least 150,000 dunams and that the total area of irrigated crops is at least 160,000 dunams because of more widespread double cropping. This amount of crop land would require about 184 mcm of water annually.[1] Completion of all the reservoir and irrigation canal projects now under construction will probably increase total irrigation water usage to at least 200 mcm during the next several years.

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[1]Assumes an average crop requirement of 700 m^3 per dunam at 60 percent system efficiency, requiring 1150 m^3/yr./dunam.

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TABLE 2

Irrigated Area and Rainfall in Syria's Yarmuk Basin (1000 dunams)

Year	Irrig. Land	Actually Cropped	Rainfall at Dar'a Amount (mm)[1]	Years
1973	82	-	196 (low)	1972-1973
1974	90	-	389 (high)	1973-1974
1975	91	81	141 (low)	1974-1975
1976	155	138	253 (ave)	1975-1976
1977	124	116	222 (low)	1976-1977
1978	100	95[2]	183 (low)	1977-1978
1979	130	125[2]	120 (low)	1978-1979
1980	120	120[2]	362 (high)	1979-1980
1981	140	145[2]	(ave)	1980-1981
1982	140	145[2]	(low)	1981-1982
1983	150[2]	155[2]	(high)	1982-1983
1984	150[2]	160[2]	(ave)	1983-1984

[1]Long-term average is 283 mm annually

[2]Estimated.

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Springs

Syria's Yarmuk Basin contains 45 springs that produce an average of 145 mcm of water per year, or about a third of the Yarmuk's historic flow. Although only scattered usage data are available, we believe that most of this spring water is tapped at or near its source for irrigation projects. The largest spring, at Muzayrib, produces on average 44 mcm annually and supplies a major irrigation project. Like streamflow, spring flow depends on annual precipitation; output of the Muzayrib spring ranged from 20 mcm following the dry 1972-73 season to 50 mcm after the wetter year in 1975-76.

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in the late 1970's springs supplied water to at least 78,000 dunams of irrigated land in the Yarmuk basin. We believe this amount is increasing, although most subsequent expansion of water supplies has come from reservoirs and wells.

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Reservoirs

Syria began building dams in the Yarmuk Basin in about 1970 to catch surface runoff during the winter and the perennial flow of springs feeding Yarmuk Tributaries. The first reservoir to be completed was a 15 mcm capacity facility at Dar'a. By 1978 reservoirs in the Yarmuk Basin had a combined capacity of 25 mcm and others with a capacity of 33 mcm were under construction. Most reservoirs were designed almost entirely for irrigation purposes; a few of the smaller ones in the eastern part of the basin were built for municipal uses. In addition, at least a dozen smaller water catchments that probably serve as stock-watering ponds were built on smaller tributaries. At the present time, we estimate that 15 Syrian dams have been completed or are under construction in the Yarmuk Basin with a combined capacity of about 81 mcm. We are not able to estimate the amount of water they actually divert from the Yarmuk because we cannot estimate how much of their capacites are filled and we do not know if the irrigation systems associated with even the completed reservoirs are in full operation.[1] Nevertheless, the resevoirs have clearly contributed to a significant reduction in the Yarmuk's flow, particularly since 1980.

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[1]Theoretically, the amount of water withdrawn from a reservoir could be much larger than the one-time storage capacity because filling and withdrawing could take place during the entire year.

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TABLE 3

Reservoirs in the Yarmuk Basin

Name	Capacity	Year Built	Associated Irrigated Land[1] (dunams)
SYRIA[2]	81.6		163,000
1. Ruwayhinah	2.0	1982-84	1,300
2. Al Hajjah (Radimneh ?)	3.0	1980-81	1,000
3. Ar Rafid (Buraykeh ?)	6.0[3]	U/C	10,000
4. Ghadir al Bustan (Tasil)	12.0	1983	34,000
5. Shaykh Miskin	15.0	1982	20,000
6. Ibta, East	3.0	Mid-70's	
7. Ibta, West	1.0	Mid-70's	5,000
8. Adwan	6.0[3]	U/C	
9. Jallin (Abdeen/Shajara)	6.5	1980-83	22,000
10. Rum	4.6	1978	
11. Al Musayfirah	3.0[3]	1980-81	
12. Sahaweh	1.0	1980	
13. Dar'a	15.0	early 70's	70,000
14. Habran	2.0	1981	
15. Al Ain	1.5	1966[4]	
ISRAELI-OCCUPIED GOLAN HEIGHTS	9.5		
16. Merom Golan	3.0[3]		
17. Yonatan (Syrian built)	1.5[3]		
18. Hital (Avne Etan)	5.0		
JORDAN	2.0		
19. Az Zumlah	2.0		

[1]Irrigated land identified with some of these projects is probably also supplied from springs and wells (e.g. Muzayrib spring, with an average annual yield of 44 mcm, is probably the main water supply for the Dara project).

[2]Numbers correspond to reservoir numbers on accompanying map.

[3]Estimated

[4]Being expanded from 0.6 to 1.5 mcm

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Wells

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Wells supply only a small share of the water used in the Yarmuk Basin, probably less than 10 mcm annually. 25X1 observers report that Dar'a and Al Qunaytirah Governorates contain several hundred wells, including a number of drill rigs, but do not provide their combined output. a large Libyan-financed project with 30 wells produces about 1.2 mcm; another notes that 17 government test wells produce 1 mcm annually.[2] Many of the other wells in the area are probably small, shallow wells owned by individual farmers. 25X1 25X1

Domestic, Industrial, and Animal Consumption

We estimate that the apporximately 650,000 inhabitants of Syria's Yarmuk Basin consume about 25 mcm of water annually, of which about 22 mcm is for household and industrial use and 3 mcm for livestock. The estimate of human use is based on the assumption that per capita consumption is 100 liters per day, a typical but by no means uniform figure for parts of Syria and Jordan. Continued population growth at rates above 3 percent and improved water services could easily double this usage by the year 2000. 25X1

2 Annual totals are based on the assumption that wells operate for 12 hours per day during a six month growing season. 25X1 25X1

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